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SECTION II.—GENERAL METEOROLOGY.

DAYTIME AND NIGHTTIME PRECIPITATION AND THEIR ECONOMIC SIGNIFICANCE.

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[Dated U. S. Weather Bureau, Washington, D. C., Nov. 16, 1916.]

In meteorological studies and investigations the subject of diurnal distribution of precipitation for different portions of the United States has heretofore received little attention, although Mr. E. D. Coberly [1] has shown that at New Orleans, La., for the summer months the percentage of day rains, as compared with those occurring at night, range from 75 to 85. Mr. W. P. Stuart,[2] also, points out in the same publication some peculiarities of convectional summer rains at Galveston, Texas, which it appears occur more frequently at night, and mostly during the latter part of the night. While little attention has been given the subject in this country, a considerable amount of information on the diurnal march of rainfall in different parts of the world is given in Hann's Lehrbuch der Meteorologie, 3d ed., pages 338–346; also in Aus dem Archiv der Deutschen Seewarte, volume 18, 1895, No. 3. The information on the subject contained in these publications seems to establish a more or less general continental type of maximum rainfall during the warm hours of the day and an opposite coast type of maximum night rains, although a number of exceptions to this general rule are pointed out.

The concentration of precipitation about certain hours of the day is not only interesting from a scientific viewpoint, but has an important economic value as well. As touching the former, if in some sections of the country by far the greater portion of the total rainfall occurs during the daylight hours, while in others the reverse is true and and the greater amount occurs at night, the question as to the cause of such distribution, whether resulting from widely applicable atmospheric laws or from local geographic or topographic conditions, at once presents itself. Again, it is of interest to the forecasters of the Weather Bureau, as considered from the viewpoint of probability. If, for example, in a given locality during certain periods of the year daytime rains occur more frequently—say, in the ratio of 2 to 1—while in other sections night rains are of more frequent occurrence, that fact should have due weight in forecasting for the respective day and night periods, especially when unsettled conditions with a probability of showers obtain.

The economic side of the subject when applied to the country as a whole must be considered of great importance, especially in connection with agricultural enterprises. By far the greater portion of the activities of mankind is conducted in the open air and during the daylight hours, and while rainfall is indispensable, there is necessarily a loss of more or less time as a result of rainy weather during the working hours of the day. As the frequency and duration of rainfall vary widely for different sections of the country, there is a proportionate variation in the resulting loss of time. If in some localities, for example, this amounts to, say, 50 per cent more than in others, the question becomes of great economic importance, affecting, as it does, the earning capacity of thousands of men. In the planning of any extensive outdoor work this question of loss of time must be taken into account, and obviously a knowledge of its probable amount is necessary for an intelligent consideration of the subject.

Agricultural enterprises constitute the most extensive outdoor activity and consequently the farmers are more concerned than any other class; it is often of considerable importance to them whether rain falls during the working hours of the day, or during the night. Furthermore, other things being equal, a farmer operating in a section of the country where the average number of working hours lost is much greater than in some other section, is obviously at a material disadvantage in competition with his neighbor in the more favored district, especially when the employment of labor is on a monthly basis of compensation.

Much information is available in Weather Bureau publications showing the average amount and the important characteristics of rainfall for different localities. Among this material are statistics tabulated in convenient form for reference and for comparing one section with another, showing the average monthly number of days, midnight to midnight, on which rain to the amount of 0.01 inch or more occurs. However, these latter values have their limitations for the purpose of considering the question of actual duration of rainfall as affecting working conditions, for the reason that all days on which rain fell were given equal weight in the count, regardless of whether the day was denominated "rainy" by reason of the occurrence of a light shower of possibly a few minutes' duration, and that perhaps occurring at some time during the night, or whether rain fell continuously throughout the working hours of the day. It will be seen that a day thus designated "rainy" may be one on which little or no interruption to outdoor work results, or, on the other hand, one on which no such work is possible. Notwithstanding their limitations in this respect, these data are useful in other connections and throw a valuable light on an important climatic factor.

In considering in detail the question of rainfall duration from an economic standpoint, especially when it is desired to make comparisons between different sections of the country, data should be available for a sufficient number of representative stations to indicate general conditions, showing for each month the average actual duration of rainfall during the working hours of the day. Such compilations for the entire country, covering a sufficient period of time to give reliable and comparable results, would, however, involve a vast amount of work and a cost that can not be undertaken at this time.

The accompanying charts and diagrams, covering the period from April to September, inclusive, have been prepared as an aid in pointing out in a general way the variations in the diurnal distribution of rainfall for the different sections of the country. They bring out in this respect for different regions, certain pronounced characteristic features which have not heretofore been recognized.

[1] *See* MONTHLY WEATHER REVIEW, 1914, 42: 537.
[2] Ibidem, 1913, 41: 1225.

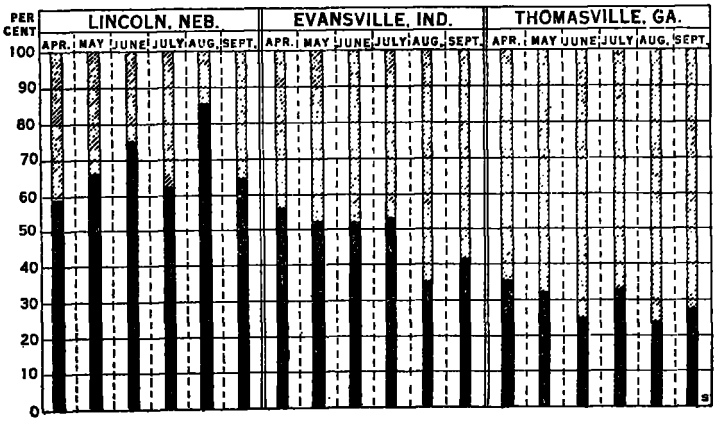

FIG. 1. Percentages of the total *rainfall* occurring at night (7P to 7A) and during the day (7A to 7P) for the months and at the localities indicated, for the 10 years 1906 to 1915. Heavily shaded portions indicate nocturnal percentages. (Standard time in local use.)

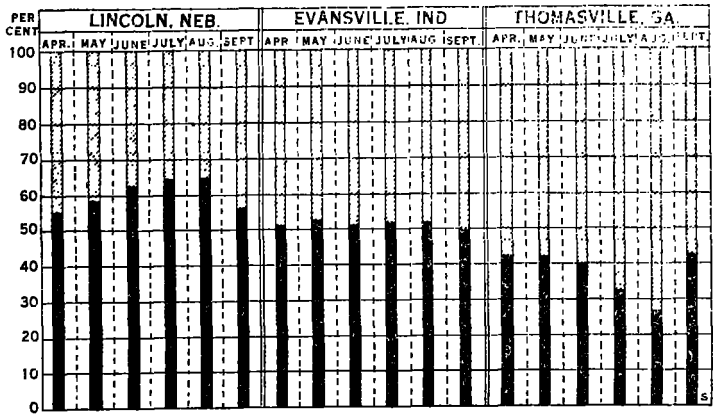

FIG. 2. Percentages of total *duration* of rain occurring at night (7P to 7A, heavy shading) and during the day (7A to 7P), for the months and at the localities indicated, for the 10 years 1906 to 1915.

By referring to these illustrations it will be seen that wide variations as to the occurrence of rainfall during the day and night obtain for different sections of the United States. The chart forming figure 8 shows the average amount of precipitation that occurs during the daytime,[3] for the period April to September, inclusive. Figure 9 shows the average amounts occurring at night for the same months, while figure 10 shows the percentage occurring at night. These charts are based on the records of about 175 regular Weather Bureau stations, well distributed throughout the country, for the 20-year period 1895 to 1914, inclusive. The most important feature of these charts is their indication of the large variations in the occurrence of night and day rains over the country east of the Rocky Mountains. The statistical basis for this portion of the charts is therefore given in detail by Table 4. From the Rocky Mountains westward the variations are not specially marked, nor is the question of so much significance, as summer rainfall in those districts is generally light and even negligible over considerable areas.

The outstanding features of figure 8 are the concentration of daytime rainfall in the Southeastern States, where falls of more than 20 inches are shown, and the regularity of the progressive decrease to the northward and westward. On figure 9, showing night rainfall, the concentration shifts to the Central Plains States, where falls of 12 to 15 inches are shown, and from this region there likewise appears a regular and progressive decrease in all directions. These contrasts are brought out graphically on a percentage basis in figure 10, which shows that for portions of the Southeastern States only about 25 per cent of the total fall occurs at night, while in the Central Plains districts from 60 to 65 per cent, or more, occurs during that time. The number and length of the records used in the preparation of these charts and their uniform and comparable indications insure that they are representative of actual conditions.

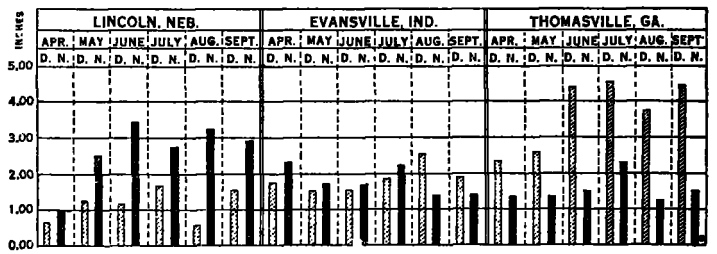

FIG. 3. Average *amount of rain* that fell during the day (7A to 7P) and during the night, (7P to 7A, heavy shaded columns), for the months and at the places shown, for the 10 years 1906 to 1915.

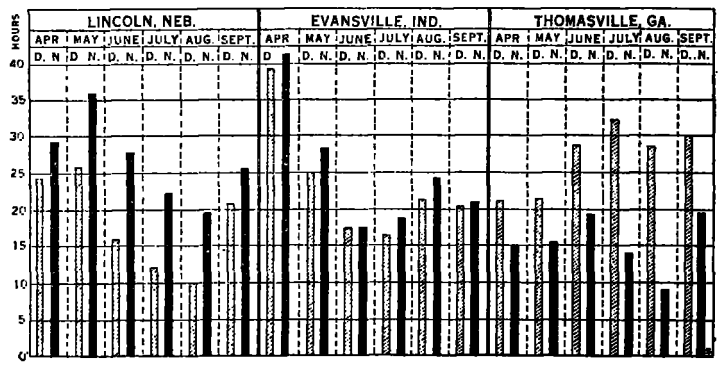

FIG. 4. Average number of hours by night (7P to 7A) and by day (7A to 7P) during which rain *fell* in the months and at the places indicated, for the 10 years 1906 to 1915.

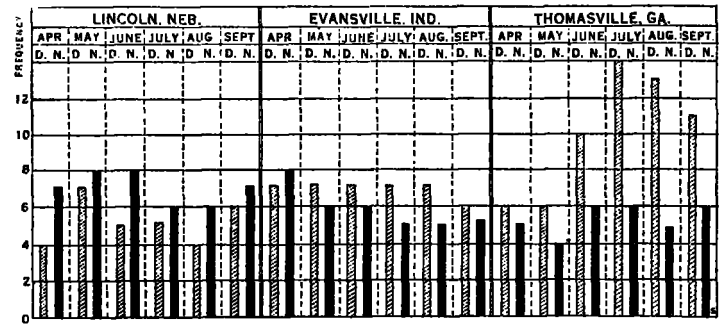

FIG. 5. The average number of days and of nights during which rain to the amount of 0.01 inch or more, fell in the months and at the places indicated, for the 10 years 1906 to 1915.

The charts just referred to show in a general way the distribution of day and night rains, but for application in detail to economic questions one needs to know the actual duration of rainfall during the working hours of the day, and it is regretted that it is not possible at this time to make a general survey of rainfall duration for all sections of the country, based on local mean time. However, these details are shown for three representative stations in figures 1 to 7. Lincoln, Nebr., is more or less representative of the area in which night rains predominate; Thomasville, Ga., of the opposite conditions, and Evansville, Ind., of the regions in which the day and night rains are more or less equal, both in amount and actual duration.

Tables 1, 2, and 3 show the amounts, duration, and frequency of daytime and nighttime rainfall for each of these points for the months of April to September, inclu-

[3] The terms "day" and "night" as used in this paper, unless otherwise indicated, have reference to the period from 8 a. m. to 8 p. m., and from 8 p. m. to 8 a. m., respectively, *75th meridian time*, the division points corresponding to the hours of the regular twice-daily observations at the regular Weather Bureau stations.

sive, for the 10-year period 1906–1915. The corresponding average values for the same periods are graphically presented in figures 1 to 5.

Figure 1 shows the percentages of the total rainfall occurring at night and during the day, and figure 2 indicates similar values for rainfall duration. Figure 3 shows the average amounts for the respective day and night periods, while figure 4 shows the average duration by day and by night. These latter values were computed by charting the beginning and the ending of each rain during the entire period and including only the time during which rain was actually falling. In compiling data on which figures 2 and 4 are based, when the exact beginnings or endings of night rains were in doubt, the automatic record sheets were consulted and the times determined from them as nearly as possible; this procedure insures that any inaccuracy in this respect is negligible. Figure 5 shows the average number of days and the average number of nights during which not less than 0.01 inch fell. Each of these diagrams is based on records covering the uniform 10-year period 1906–1915, the day and night division hours (7ª and 7ᵖ) being on standard time in local use.

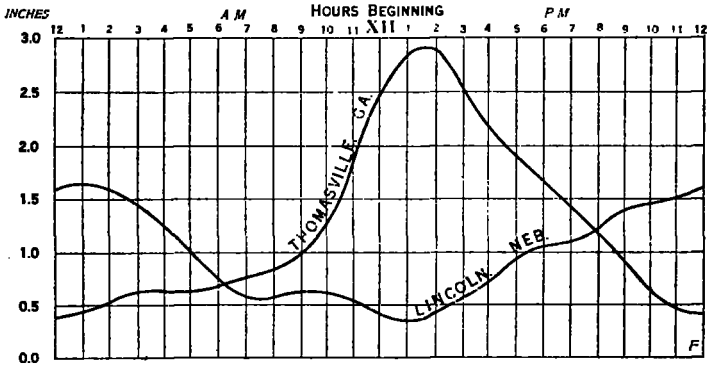

FIG. 6. The average hourly rainfall for the season, April to September, incl., for the 10 years 1906 to 1915, at Thomasville, Ga., and Lincoln, Nebr.

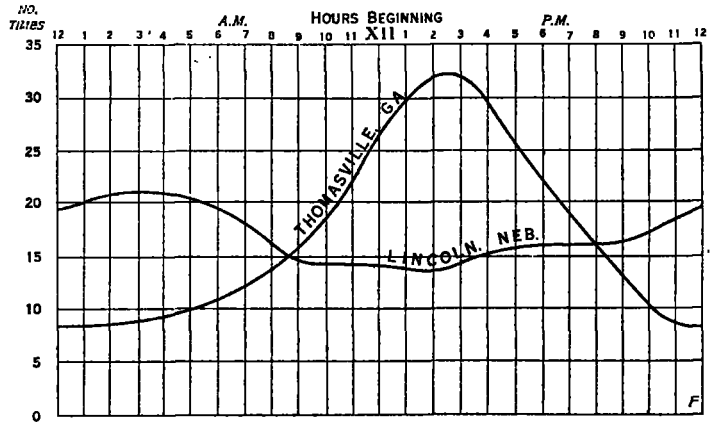

FIG. 7. The average hourly frequency of rainfall for the season, April to September, incl., for the years 1906 to 1915, at Thomasville, Ga., and Lincoln, Nebr.

Figure 6 shows for Lincoln, Nebr., and Thomasville, Ga., the diurnal march of rainfall as indicated by the average hourly amounts, local mean time, for the 6-month period, April to September, inclusive, while figure 7 shows for the same stations and period the average frequency of rainfall. Figure 6 is based on the average amount of precipitation recorded for each hour of the day for the entire six months and figure 7 on the average number of times rain occurred during the respective hours; both are compiled for the 10-year period 1906–1915. Owing to the short interval of time for which the data are compiled (one hour) the results are shown by a curve, smoothed by the simple formula $(a+2b+c)/4$. These graphs clearly indicate the characteristics of the daily march of rainfall for the two pronounced types of daytime and night rains previously pointed out.

In the region of dominant night rains the average amount for the night is considerably greater than for the day in all months represented by the graphs, the contrast being especially marked during the month of August; this is also true for both the duration and frequency. In the southeastern States even more pronounced opposite conditions obtain, and here again the greatest day and night contrasts are shown for the summer months. From the data shown for Evansville, Ind., the writer concludes that in regions where the distribution of day and night rainfall is comparatively uniform, the average duration for the respective periods is also nearly equal, but that rain occurs as a rule with somewhat greater frequency during the daylight hours.

In the Central Plains region, where farming is conducted on a large scale and where wheat is the principal product, we find that the greatest concentration of night rains occurs in the harvest and threshing season, during which daytime rains are comparatively infrequent. This means much to the farmers of that section, as otherwise it is probable that they would often experience great difficulty gathering the immense crops grown.

Aside from this fact, the more frequent night rainfall in these interior districts has another important bearing on agriculture. Here the average annual precipitation is small as compared with that received in other important agricultural States to the eastward of the Rocky Mountains. Notwithstanding this, these States rank agriculturally among the most important in the country. It has long been recognized that this is largely due to that provision of nature which so distributed the factors that control the occurrence of rainfall as to insure the receipt of much the greater portion of the annual amount during the warm or growing season. Had the distribution been uniform throughout the year as in the more eastern districts, these fertile plains would have been a barren waste. In addition to this we now find that another happy provision has been made in that the greater portion of the warm-season rainfall occurs during the night; that is, at a time when it will do the maximum amount of good.

Summer rains in the United States occur largely in the form of thundershowers; droughts of more or less intensity are of rather frequent occurrence especially in the Plains States, and are usually accompanied by high temperatures. During such periods the amount of benefit to vegetation brought by showers of small or moderate amounts depends very largely on the time of occurrence, whether in the heated hours of the day or the relatively cool night. After a daytime shower the hot sunshine usually causes rapid evaporation and crusts the cultivated soil, so that little or no benefit and often actual harm results. When the summer showers occur at night, the moisture penetrates the soil to a much greater depth, little evaporation occurs, usually crusts are not formed, and a maximum of benefit results. In the Southeastern States, where the summer rainfall is usually abundant, the question of diurnal distribution so far as its bearing on the development of vegetation is concerned, is not of so great importance.

The dominance of daytime rains in the Southeast and along the immediate Gulf coast is undoubtedly due to atmospheric convection during the warmer portions of the day, a characteristic of tropical and semitropical rainfall conditions, but just why there should be so well-defined an area and so pronounced a type of night rainfall in the Central Plains region, with a progressive diminution in all directions, is not readily apparent.

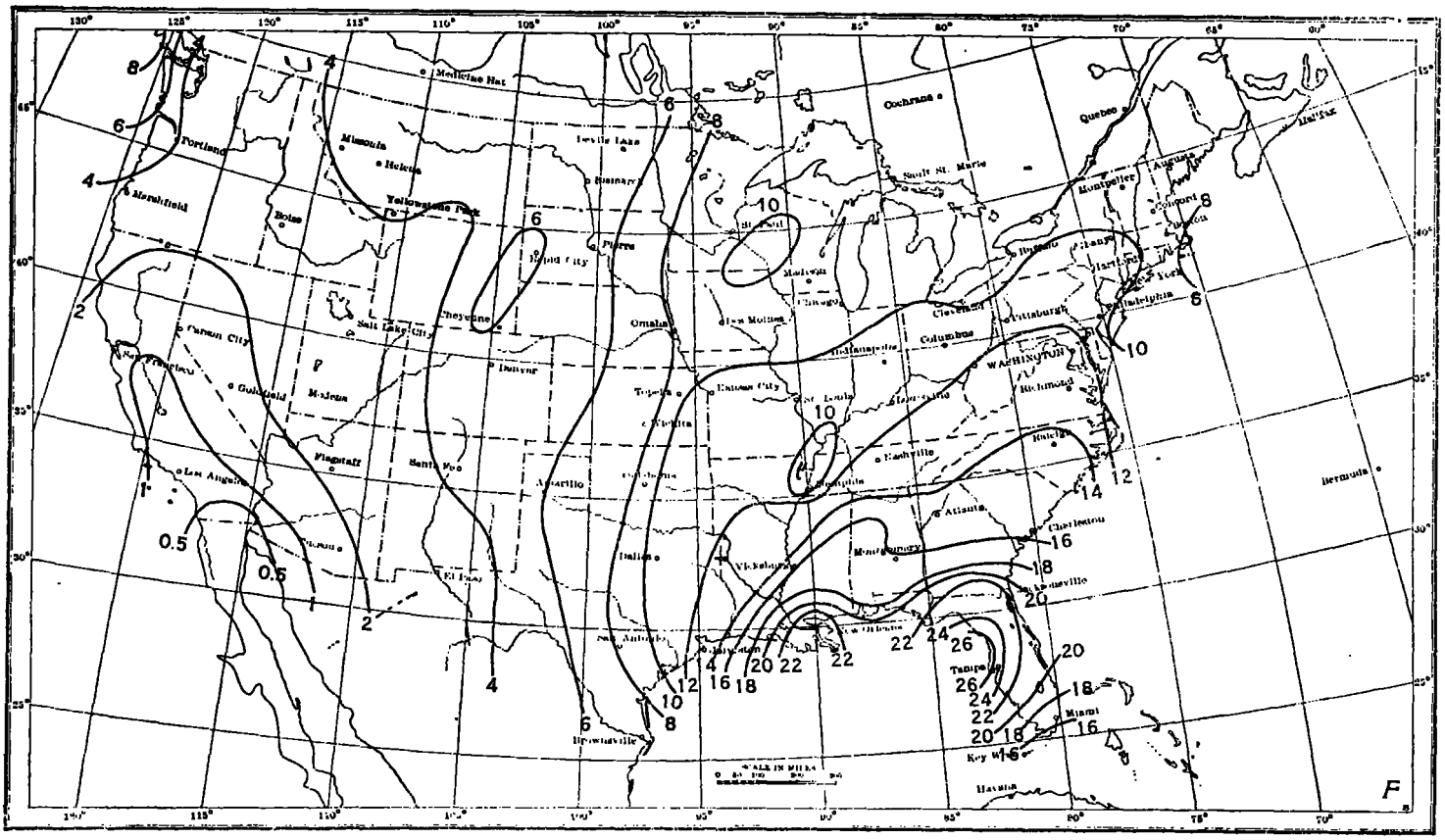

FIG. 8. Average precipitation in inches, during the day (8a to 8p) for the season, April to September, incl., 1895 to 1914. (Based on about 175 Weather Bureau stations, and 75th M. time.

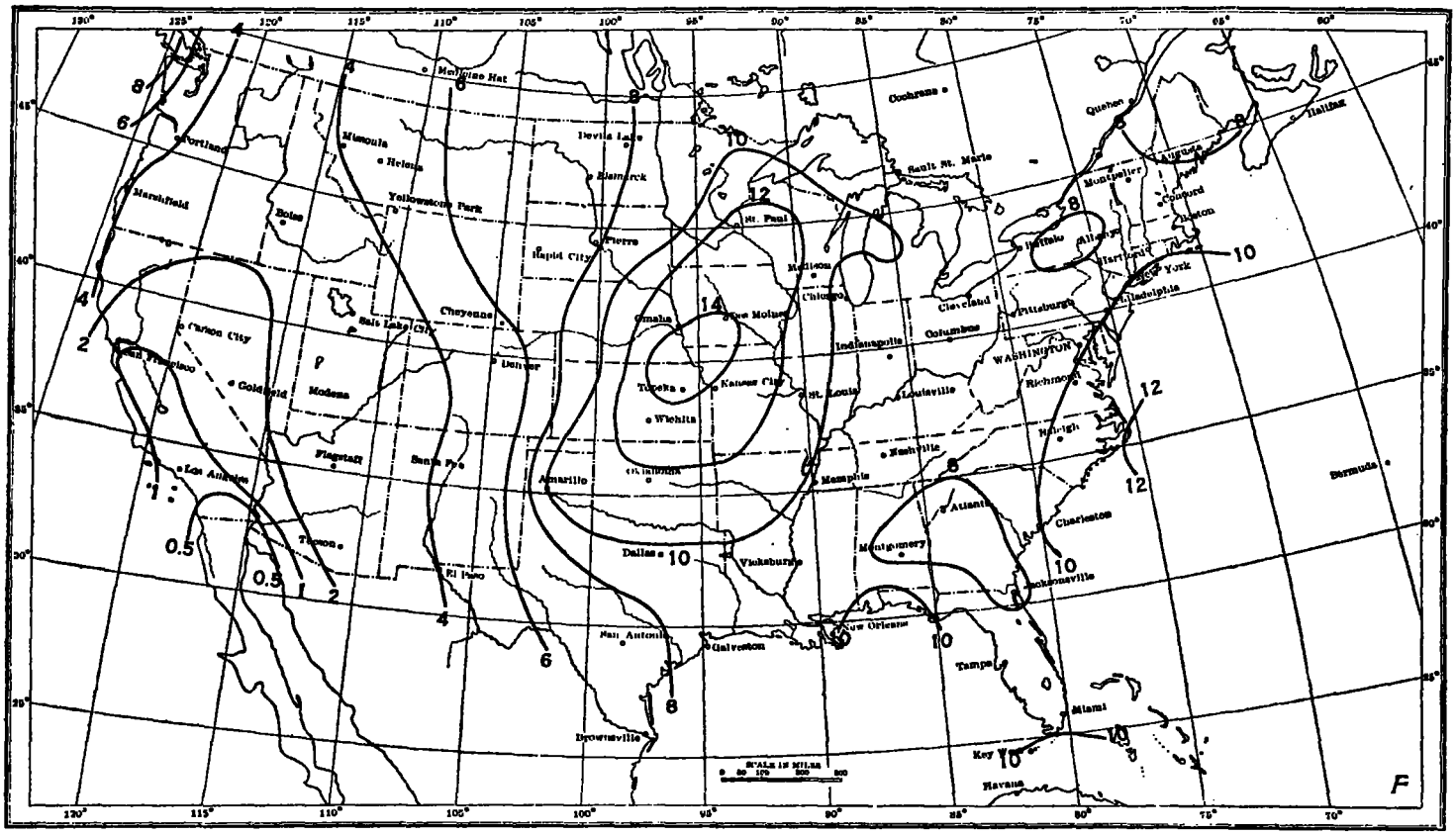

FIG. 9. Average precipitation in inches, during the night (8p to 8a) for the season, April to September, incl., 1895 to 1914. (Based on about 175 Weather Bureau stations, and 75th M. time.)

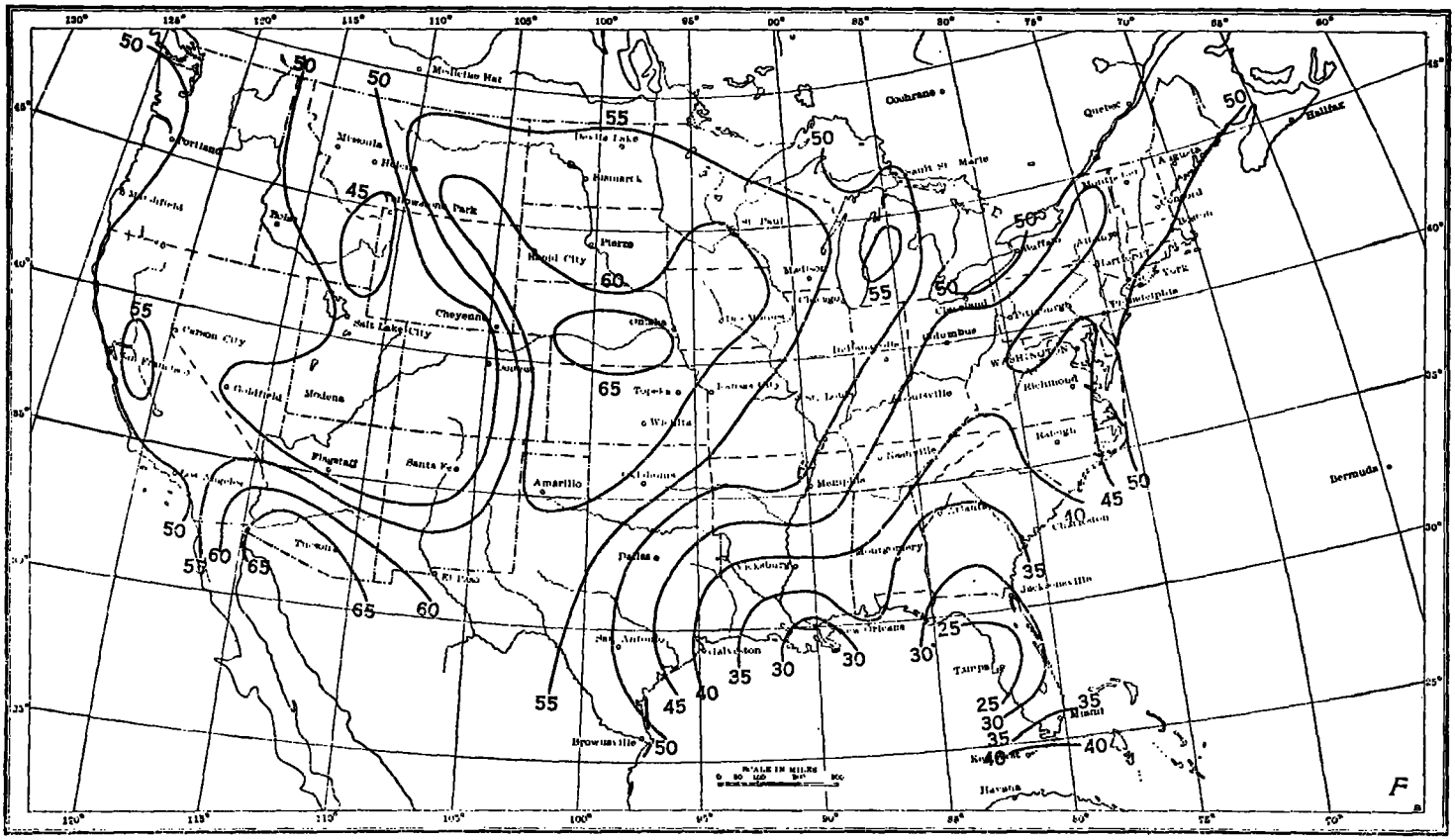

FIG. 10. Percentage of the average precipitation for the season, April to September, incl., 1895 to 1914, that occurs at night (8p to 8a). (Based on about 175 Weather Bureau stations, and 75th M. time.)

TABLE 1.—*Monthly totals of daytime and nighttime rainfalls for April to September, incl., during the 10 years 1906–1915.*

Lincoln, Nebr.

Year.	April.		May.		June.		July.		August.		September.	
	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.
	In.	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
1906.....	2.23	1.19	0.71	0.91	0.81	2.31	5.30	2.03	2.60	0.14	5.36	2.24
1907.....	0.55	0.46	0.60	2.59	1.49	4.76	0.11	3.55	0.25	3.92	2.27	1.67
1908.....	0.37	0.91	0.77	3.56	2.03	9.21	2.25	5.83	0.21	2.61	0.23	0.30
1909.....	0.10	1.23	3.44	2.11	0.29	2.87	0.48	4.39	0.04	1.26	1.40	3.29
1910.....	0.01	0.01	2.28	1.33	1.24	0.85	2.85	0.18	0.35	13.86	1.98	3.08
1911.....	0.35	2.12	0.58	3.46	0.07	0.49	0.06	1.77	0.05	0.27	0.95	3.71
1912.....	1.67	0.70	0.10	0.84	0.73	2.41	1.06	1.12	0.72	3.39	1.09	2.00
1913.....	1.26	1.20	2.91	3.11	1.04	1.23	0.17	1.78	0.15	0.16	1.06	2.24
1914.....	0.48	1.86	0.14	4.06	1.91	8.80	3.61	1.23	0.58	0.89	0.88	7.44
1915.....	0.44	0.84	1.36	3.50	2.18	1.72	1.57	5.30	0.68	4.89	0.83	3.09
Sums....	7.46	10.51	12.89	25.47	11.79	34.65	17.46	27.18	5.63	31.33	16.05	29.06
Means...	**0.75**	**1.05**	**1.29**	**2.55**	**1.18**	**3.46**	**1.75**	**2.72**	**0.56**	**3.13**	**1.60**	**2.91**

Evansville, Ind.

1906.....	0.71	0.96	0.75	0.32	2.43	0.59	2.84	2.37	3.44	0.95	3.46	0.70
1907.....	1.14	1.29	1.84	2.05	1.98	2.31	2.72	1.94	4.69	1.26	1.23	1.53
1908.....	1.71	3.23	2.64	3.87	0.26	0.40	1.79	0.18	3.68	0.90	0.28	0.95
1909.....	1.39	3.82	1.87	0.60	1.08	2.13	0.89	4.84	0.17	0.24	1.11	1.19
1910.....	1.71	2.58	0.91	1.72	0.46	2.66	4.73	5.59	0.43	0.53	2.22	1.17
1911.....	4.21	4.15	0.70	1.63	1.88	2.42	0.44	0.42	1.85	3.07	2.37	0.88
1912.....	2.41	4.61	2.13	1.71	1.44	1.92	2.98	2.32	1.70	2.30	1.81	0.83
1913.....	1.96	1.23	0.32	0.27	0.96	0.59	0.41	0.94	1.05	0.69	1.69	2.62
1914.....	2.09	0.74	0.26	0.77	3.67	0.32	0.44	0.97	2.68	0.91	2.51	2.55
1915.....	0.35	0.05	4.10	3.86	0.79	2.90	1.26	1.65	5.64	2.20	2.20	0.78
Sums....	17.68	22.66	15.52	16.80	14.95	16.24	18.50	21.22	25.33	13.05	18.88	13.20
Means...	**1.77**	**2.27**	**1.55**	**1.68**	**1.50**	**1.62**	**1.85**	**2.12**	**2.53**	**1.30**	**1.89**	**1.32**

Thomasville, Ga.

1906.....	0.18	T.	4.51	1.57	2.76	0.47	4.73	4.03	4.53	2.98	7.28	2.18
1907.....	3.02	4.02	4.80	1.27	2.23	2.35	2.89	5.98	3.07	1.55	6.98	1.67
1908.....	3.01	1.61	1.22	2.69	1.94	1.06	6.70	0.70	2.98	0.05	2.94	1.30
1909.....	3.55	1.17	1.37	0.66	10.18	0.90	4.73	1.73	6.12	0.84	5.09	0.98
1910.....	0.80	0.92	2.34	0.01	8.01	2.08	4.84	2.30	3.94	0.68	2.41	0.14
1911.....	3.06	0.34	3.06	0.34	4.08	0.22	6.94	0.67	2.56	1.31	2.50	0.02
1912.....	7.42	2.91	2.03	0.09	3.04	3.57	4.84	0.50	5.60	1.52	6.45	3.97
1913.....	0.50	0.88	1.63	0.97	4.95	3.22	1.96	2.82	2.18	1.58	1.67	0.63
1914.....	1.53	0.25	1.27	0.18	2.10	0.30	3.40	3.02	3.84	0.12	4.44	3.14
1915.....	0.08	0.49	3.99	4.76	3.81	0.34	4.05	0.63	2.50	0.26	3.96	0.45
Sums....	23.15	12.59	26.22	12.54	43.10	14.51	44.58	22.38	37.32	10.89	43.72	14.48
Means...	**2.32**	**1.26**	**2.62**	**1.25**	**4.31**	**1.45**	**4.46**	**2.24**	**3.73**	**1.09**	**4.37**	**1.45**

TABLE 2.—*Monthly total duration (in hours and minutes) of daytime and nighttime rainfalls for April to September, incl., during the 10 years 1906–1915.*

Lincoln, Nebr.

Years.	April.		May.		June.		July.		August.		September.	
	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.
	H. m.	*H. m.*	*H. m.*	*H. m.*	*H. m.*	*H. m.*	*H. m.*	*H. m.*	*H. m.*	*H. m.*	*H. m.*	*H. m.*
1906.....	33 52	37 10	7 47	15 55	11 05	21 19	15 40	13 15	13 07	5 47	26 23	17 42
1907.....	22 33	19 23	27 43	34 50	19 50	29 30	9 27	15 03	10 36	14 18	22 07	22 01
1908.....	16 33	15 15	34 15	45 12	27 06	62 51	19 56	24 05	11 41	24 55	9 35	7 20
1909.....	24 20	42 26	20 17	32 10	11 38	26 07	22 00	50 52	2 09	7 00	29 13	45 54
1910.....	20 20	25 25	44 03	40 46	9 15	12 15	9 37	7 22	16 23	32 19	17 51	21 25
1911.....	20 51	37 07	18 24	26 46	2 37	2 04	3 51	14 25	3 50	18 30	21 16	33 22
1912.....	21 05	11 18	4 00	31 03	25 00	33 26	5 48	21 30	20 39	24 01	31 45	36 07
1913.....	48 50	55 15	31 01	59 03	5 54	24 29	5 21	24 35	2 42	5 45	21 52	24 39
1914.....	15 06	24 29	8 59	14 33	14 43	28 12	10 46	4 14	7 08	22 00	9 23	25 18
1915.....	12 15	16 59	62 00	57 56	30 09	25 26	17 42	45 29	14 03	37 21	20 58	28 28
Sums....	235 45	284 47	261 29	358 14	157 23	275 33	120 08	220 50	102 18	191 56	210 24	262 16
Means...	**23 34**	**28 29**	**26 09**	**35 49**	**15 44**	**26 33**	**12 00**	**22 00**	**10 14**	**19 10**	**21 00**	**26 14**

Evansville, Ind.

1906.....	18 54	15 39	12 58	10 05	21 44	14 11	22 07	19 50	30 58	13 32	52 50	42 40
1907.....	35 35	48 50	29 35	42 10	14 32	16 32	13 53	10 43	30 25	27 23	13 50	20 07
1908.....	45 48	59 39	25 49	36 07	15 17	10 52	23 14	20 06	11 49	19 35	6 47	12 30
1909.....	14 00	35 27	36 27	38 35	18 25	31 05	14 58	22 33	3 49	3 20	7 58	16 14
1910.....	65 12	65 57	34 25	46 08	15 43	27 05	27 36	31 57	9 46	8 27	12 58	14 25
1911.....	50 24	56 29	14 29	16 55	21 01	19 15	18 16	6 58	14 04	30 20	17 18	28 40
1912.....	38 46	61 13	31 20	23 01	23 00	20 10	20 42	18 17	25 46	23 14	15 01	20 30
1913.....	56 14	36 10	16 31	6 10	11 58	6 13	6 01	19 47	8 20	10 43	36 41	29 18
1914.....	50 12	29 04	7 05	2 10	7 54	8 59	6 27	8 58	32 03	37 31	18 49	11 09
1915.....	17 35	5 35	44 29	62 00	21 16	19 41	10 14	20 45	46 30	63 40	21 25	10 45
Sums....	392 40	414 03	253 08	283 21	170 50	174 03	163 28	179 54	213 30	237 45	203 37	206 18
Means...	**39 16**	**41 24**	**25 19**	**28 20**	**17 00**	**17 24**	**16 21**	**17 59**	**21 21**	**23 46**	**20 22**	**20 38**

Thomasville, Ga.

1906.....	1 54	0 10	39 45	30 36	32 50	24 27	30 57	17 28	34 15	20 00	26 08	17 20
1907.....	41 13	55 58	32 58	23 36	15 20	13 40	39 06	37 35	35 04	6 25	50 08	34 06
1908.....	26 39	8 09	9 05	15 57	10 57	5 44	39 06	5 58	26 19	3 35	28 44	36 09
1909.....	33 14	21 03	19 03	18 51	33 42	11 45	42 22	36 04	22 49	12 13	18 00	4 27
1910.....	11 45	9 52	12 40	2 22	60 49	48 59	28 06	4 35	19 58	6 03	12 35	5 20
1911.....	14 53	8 10	24 56	7 38	25 05	8 23	42 17	9 03	27 08	6 08	10 15	2 23
1912.....	40 32	22 00	10 35	7 11	49 44	43 14	33 02	5 07	33 01	13 25	53 05	49 14
1913.....	16 03	11 22	17 58	20 44	21 23	11 48	20 18	6 54	20 47	17 27	24 25	13 27
1914.....	9 26	2 41	6 51	2 16	12 44	13 57	21 19	14 56	36 58	4 39	48 55	2 34
1915.....	11 43	11 20	36 31	25 49	14 58	4 13	20 07	6 13	20 59	2 20	26 25	23 20
Sums....	207 22	150 45	210 22	155 00	277 31	186 10	316 49	143 53	277 18	92 15	298 38	188 20
Means...	**20 44**	**15 00**	**21 00**	**15 30**	**27 45**	**18 37**	**31 40**	**14 23**	**27 44**	**9 14**	**29 52**	**18 50**

TABLE 3.—*Monthly numbers of days and of nights on which 0.01 inch or more of rain fell, from April to September, incl., during the 10 years 1906–1915.*

Lincoln, Nebr.

Years.	April.		May.		June.		July.		August.		September.	
	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.	Day.	Night.
1906	8	9	5	6	5	6	8	6	7	4	8	6
1907	3	5	9	7	5	11	2	7	3	6	5	7
1908	4	8	9	15	9	15	7	5	7	11	2	1
1909	2	8	7	7	3	6	5	8	2	12	7	10
1910	1	1	9	9	4	4	5	2	4	7	3	6
1911	5	9	5	8	2	4	1	3	3	7	4	5
1912	4	5	2	6	8	7	3	6	7	5	9	11
1913	7	7	9	8	1	8	3	6	2	2	6	7
1914	3	7	2	5	5	13	5	4	3	6	7	5
1915	6	7	11	11	8	7	9	12	6	10	6	8
Sums	43	66	68	82	50	81	48	59	44	60	57	66
Means	4	7	7	8	5	8	5	6	4	6	6	7

Evansville, Ind.

1906	4	4	5	5	8	6	8	4	8	5	10	7
1907	5	9	9	9	7	6	7	5	10	6	6	6
1908	8	12	7	7	5	5	8	4	4	4	1	1
1909	4	8	10	7	8	11	6	5	3	2	4	6
1910	11	13	9	7	5	4	11	10	5	3	5	4
1911	11	10	4	4	7	5	5	4	6	5	7	8
1912	9	9	7	8	7	3	11	7	10	9	3	4
1913	8	7	4	3	5	3	2	4	4	4	9	7
1914	7	6	2	2	8	2	3	2	9	6	4	4
1915	4	2	14	12	7	10	6	7	15	8	6	3
Sums	71	80	71	64	67	55	67	52	74	52	55	50
Means	7	8	7	6	7	6	7	5	7	5	6	5

Thomasville, Ga.

1906	1	0	8	5	9	4	16	9	16	10	9	4
1907	10	11	6	3	7	5	15	6	15	5	15	12
1908	7	6	3	3	9	4	16	5	11	3	10	7
1909	10	8	8	5	10	4	16	7	12	5	7	5
1910	4	5	6	1	16	10	18	3	11	6	6	2
1911	4	5	8	5	11	5	18	7	15	2	11	1
1912	8	8	5	2	14	9	15	4	14	6	14	11
1913	5	2	5	5	13	8	8	3	11	9	11	4
1914	4	2	4	2	7	6	10	9	15	2	12	6
1915	3	3	10	7	5	2	11	3	12	1	11	3
Sums	56	50	63	38	101	57	143	56	132	49	106	55
Means	6	5	6	4	10	6	14	6	13	5	11	6

TABLE 4.—*Average seasonal total and nighttime (8P to 8A, 75th M. t.) precipitation at Weather Bureau stations east of the Rocky Mountains, April to September, incl., for the 20-year interval 1895–1914.*

[Based on continuous records by the automatically recording raingage.]

Stations (arranged geographically).	Average seasonal totals.	Average nighttime falls (8P to 8A, 75th M. t.).	
		Amount.	Percentage of total seasonal.
Atlantic coast:	*Inches.*	*Inches.*	*Per cent.*
Eastport, Me	16.1	8.0	50
Portland, Me	18.4	8.8	48
Burlington, Vt	16.9	8.3	49
Northfield, Vt	17.7	8.0	45
Boston, Mass	18.4	8.8	48
Hartford, Conn	19.9	9.9	49
New Haven, Conn	21.5	11.0	51
Albany, N. Y	17.2	8.0	46
Ithaca, N. Y	18.4	7.4	40
Binghamton, N. Y	17.4	7.5	43
New York, N. Y	21.0	9.4	45
Scranton, Pa	20.4	9.5	46
Harrisburg, Pa	18.5	8.5	46
Philadelphia, Pa	22.6	10.7	47
Atlantic City, N. J	19.5	10.5	54
Baltimore, Md	22.7	9.1	40
Washington, D. C	23.0	10.2	44
Norfolk, Va	23.9	10.1	42
Richmond, Va	22.7	10.0	44
Lynchburg, Va	22.6	9.8	43
Wytheville, Va	22.1	8.3	37
Asheville, N. C	23.4	9.4	40
Charlotte, N. C	23.6	9.6	41
Raleigh, N. C	26.4	10.8	41
Hatteras, N. C	25.0	13.5	54
Wilmington, N. C	25.7	10.3	40
Charleston, S. C	24.2	10.9	45
Columbia, S. C	25.5	9.6	38
Augusta, Ga	24.5	8.3	34
Atlanta, Ga	22.3	7.8	35
Macon, Ga	21.6	7.8	36
Savannah, Ga	26.8	9.5	35
Thomasville, Ga	31.2	8.9	28
Jacksonville, Fla	30.0	7.7	26
Gulf region:			
Key West, Fla	22.0	10.1	46
Tampa, Fla	35.5	8.4	24
Pensacola, Fla	30.1	12.1	40
Mobile, Ala	34.2	12.5	37
Montgomery, Ala	23.4	7.6	32
Birmingham, Ala	26.3	9.3	35
Meridian, Miss	27.0	9.6	36
Vicksburg, Miss	23.2	9.4	41
New Orleans, La	32.6	8.2	25
Shreveport, La	21.2	8.4	40
Little Rock, Ark	23.4	11.2	48
Fort Worth, Tex	20.0	10.0	50
Taylor, Tex	17.1	7.6	44
Galveston, Tex	23.6	11.1	47
Corpus Christi, Tex	13.8	6.8	49
San Antonio, Tex	15.2	7.0	46
Ohio Valley and Tennessee:			
Memphis, Tenn	19.5	10.1	52
Nashville, Tenn	22.2	9.8	44
Chattanooga, Tenn	22.3	9.4	42
Knoxville, Tenn	23.0	9.7	42
Lexington, Ky	20.7	9.0	43
Louisville, Ky	20.3	9.5	47
Evansville, Ind	20.1	9.8	49
Indianapolis, Ind	20.0	9.7	48
Cincinnati, Ohio	17.5	7.9	45
Columbus, Ohio	17.9	7.6	42
Parkersburg, W. Va	20.2	9.0	45
Elkins, W. Va	27.2	12.6	46
Pittsburg, Pa	19.0	8.5	45
Great Lakes region:			
Oswego, N. Y	17.5	8.8	50
Rochester, N. Y	15.8	7.4	47
Buffalo, N. Y	16.1	8.4	52
Erie, Pa	18.2	9.7	53
Cleveland, Ohio	17.5	8.4	48
Sandusky, Ohio	19.2	8.6	45
Toledo, Ohio	18.4	8.7	47
Detroit, Mich	17.8	8.6	48
Port Huron, Mich	16.1	7.8	48
Alpena, Mich	16.1	7.6	47
Grand Rapids, Mich	19.9	11.8	59
Grand Haven, Mich	17.7	10.4	59
Chicago, Ill	18.7	9.9	53
Milwaukee, Wis	17.7	9.6	54
Green Bay, Wis	20.2	11.1	55
Escanaba, Mich	18.7	9.3	50
Sault Ste. Marie, Mich	16.4	8.3	51
Marquette, Mich	17.9	8.8	49
Houghton, Mich	17.9	9.3	52
Duluth, Minn	19.5	10.6	54
Upper Mississippi Valley:			
St. Paul, Minn	21.0	12.5	60
La Crosse, Wis	22.1	12.0	54
Madison, Wis	20.4	11.3	55
Charles City, Iowa	22.7	12.6	56
Dubuque, Iowa	21.1	12.8	61
Davenport, Iowa	20.1	11.3	56
Des Moines, Iowa	22.9	13.8	60
Keokuk, Iowa	22.2	13.0	58
Peoria, Ill	20.5	11.4	56
Springfield, Ill	20.6	10.9	53
Hannibal, Mo	22.9	12.9	56
St. Louis, Mo	21.0	10.8	51
Cairo, Ill	18.9	9.4	50
Plains region:			
Del Rio, Tex	13.1	7.2	55
Abilene, Tex	16.6	8.9	53
Fort Smith, Ark	21.5	11.4	53
Bentonville, Ark	20.0	12.8	64
Springfield, Mo	25.4	13.0	51
Columbia, Mo	24.0	13.1	55
Kansas City, Mo	25.8	15.4	60
Topeka, Kans	24.1	14.8	61
Iola, Kans	24.8	13.6	55
Wichita, Kans	21.6	13.7	63
Oklahoma, Okla	20.2	11.5	57
Amarillo, Tex	16.5	10.4	63
Dodge City, Kans	15.7	9.6	61
Concordia, Kans	21.0	13.5	64
Lincoln, Nebr	23.3	15.4	66
Omaha, Nebr	20.0	12.5	62
North Platte, Nebr	14.5	9.8	68
Sioux City, Iowa	20.3	12.0	59
Yankton, S. Dak	19.9	11.6	58
Valentine, Nebr	15.0	9.3	62
Rapid City, S. Dak	13.8	7.4	54
Huron, S. Dak	15.7	9.1	58
Bismarck, N. Dak	12.5	7.3	58
Devils Lake, N. Dak	13.3	8.0	60
Williston, N. Dak	11.3	6.4	57
Havre, Mont	9.6	5.1	53